

EXHIBIT B
SCOPE OF SERVICES

City of Hendersonville Sewer Collection System AIA Master Plan Update

1 Reference

The City of Hendersonville (City) is the grantee of Asset Inventory and Assessment (AIA) funding, awarded during the Fall 2024 funding cycle, for a Sewer Collection System AIA Master Plan Update. The Sewer Collection System AIA Master Plan Update project will be led by Devin Owen from the City and Adam Sharpe from HDR Engineering, Inc. of the Carolinas (HDR). Their contact information is provided below.

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2 Introduction

Aging infrastructure, inflow and infiltration, lack of sewer capacity, and continuous growth present challenges for a community committed to providing reliable, sustainable, high-quality, and affordable wastewater services. The City is proactively responding by initiating a Sewer Collection System Master Plan (CSMP) update project to guide utility infrastructure management.

The CSMP project is intended to identify and prioritize sewer collection system improvements, including rehabilitation and replacement projects, as well as expansion projects, to meet future regulatory requirements, enhance system resiliency, maintain reliability, and meet customer needs. The services will follow the guidance provided in the Water and Wastewater Utility Evaluation Guidance Document: Asset Inventory & Assessment, Capital Cost, and Operating Cost Analyses (HDR 2020, updated DWI, 2022). Additionally, the CSMP will provide documentation of the system and its operation, and be a holistic evaluation of the existing collection system's performance and needs. This effort is envisioned as a roadmap for short-term and long-term wastewater infrastructure capital improvement planning.

The project will build and expand upon the initial AIA prepared for the City by Black & Veatch in 2019 by capitalizing on the improved accuracy of GIS data to further characterize aging infrastructure and newly added or replaced infrastructure. The prior master plan model will be used as a basis for the development of a new hydraulic model of the system and the creation of a tool for planning efficient conveyance solutions.

3 Project Tasks

Task 1 – Sewer Collection System Data & Infrastructure Review

The purpose of this task is for HDR to facilitate the project kickoff, data collection, and review of existing data for the City's sewer collection system that will inform subsequent phases of the project. HDR will perform the following:

A. Project Kickoff

HDR will facilitate a project kickoff workshop with the City's team. Planning team participants will be identified at this workshop, including the City's management, operations, and field staff. Kickoff workshop objectives include:

- Review project scope and schedule
- Define project goals, objectives, critical success factors, and desired outcomes
- Document strategic decisions for the future of the City's collection system infrastructure, which are (1) declared, (2) to be addressed in the CSMP, and (3) will not be addressed in the CSMP
- Define team member roles and responsibilities, and modes of communication

B. Data Request

HDR will request relevant utility data, documents, and reports to support the development of the CSMP. HDR will develop a data request to include the following general items related to the wastewater collection system:

- 2019 Master Plan and AIA
- Water System Master Plan
- Biosolids Master Plan
- Collection system GIS database files
- Water meter GIS database files, as well as associated water consumption
- Available data (SCADA or manually logged) for wastewater pump stations for the most recent, available 24 months
- Current wastewater collection system permits
- Current wastewater collection system models
- Sanitary sewer overflow (SSO) database
- Near-term development (capacity requests) documentation
- Computerized Maintenance Management System (CMMS) documentation, including asset hierarchy, work history reports
- Gravity sewer main CCTV inspection data
- Capital Improvement Plan, including asset renewal and replacement projects

It is noted that HDR has several of the items listed above, though the information provided may not be complete, comprehensive, or final. HDR's data request will target only information that HDR has not received as a final version.

C. Data Gap Assessment and Addressing Gaps

HDR will review existing utility data to identify gaps in the City's current database of manhole locations, rim elevations, and invert elevations. HDR will develop a gap closure plan to target areas for data collection within the collection system. As part of the implementation of the gap closure plan, HDR will gather field survey data of manhole rim elevations, inlet invert elevations, and outlet invert elevations for manholes determined to be critical to the modeling effort and missing the aforementioned data. Manholes will be identified in new areas being added to the hydraulic model with the greatest risks score, based on the 2019 master plan, and areas with the greatest potential for infiltration and inflow.

D. Pump Station Assessments

HDR will perform field condition assessments of up to 10 most critical pump/lift stations within the City's collection system. These assessments will document the visual condition of the site, structure, equipment, and accessories at each station, resulting in an overall condition rating. The condition assessment process will be standardized so it can be repeated by City O&M staff for the remaining pump stations.

TASK 1 DELIVERABLES

- Staff interview notes
- Kick-off Workshop agenda and summary
- Field survey results in Microsoft Excel for GIS dataset updates
- Pump station assessment results in Microsoft Excel

TASK 1 ASSUMPTIONS

- The project kickoff workshop is planned as a 2-hour kickoff meeting with staff to introduce the project team, establish lines of communication, and review the scope of services and project schedule.
- Workshop will be held at the City's facilities. The City will assist HDR with scheduling and reserving the workshop venue. The Task 1 kickoff workshop is anticipated to be attended by up to three HDR staff. The workshop will be scheduled at least two weeks in advance.
- The City will provide data as requested by HDR.
- Data, where applicable, is available in Excel or .csv format.
- GIS data includes horizontal and vertical attributes for manholes, pipes, and force mains.
- City staff will accompany one (1) HDR staff for the completion of the pump station assessments; City staff will complete the assessment of pump stations beyond the 10 most critical stations.

Task 2 – Hydraulic Model Development, Calibration, and Evaluations

HDR will develop, calibrate, and validate the City's sewer collection system hydraulic model in InfoWorks ICM. The general hydraulic modeling effort will include:

A. Flow Monitoring

HDR will recommend approximately 8 locations within the gravity sanitary sewer collection system for the collection of continuous flow monitoring data. Flow monitoring sites will coincide with the previous master plans' 8 locations; the flow monitoring period will be 3 months in duration and will include up to 3 rain gages.

This task includes reviewing the proposed locations and previous monitoring to confirm suitable hydraulic conditions, access, safety, and other issues that may affect data quality and suitability. Suitable equipment will be selected to suit the application to provide accurate and reliable flow data. Flow meters will be designed to measure flow in sanitary sewer pipes under free-flow and surcharged conditions and include depth and velocity sensors. Each monitoring site shall have wireless telemetry for the purposes of monitoring and maintaining the sensors and responding in a timely fashion in the event of disturbance or alarms.

Monitors will be removed at the conclusion of the study. Damage or disturbance from the installation and operation of the flow monitors or rain gauges will be repaired.

Where available and possible, pump drawdown tests and run-time data will be used to refine flow contribution from areas of the system not specifically monitored.

3.1.1 Hydraulic Model Development

HDR will update the 2019 Master Plan hydraulic model, including model software migration to InfoWorks ICM, physical network expansion, and loading updates. The model, GIS updates, and survey completed as part of this project will serve as the basis for the model development. For the purposes of this task, the City shall provide the following (as requested in Task 1):

- The 2019 Master Plan hydraulic model
- Available system GIS database
- Record drawings of new infrastructure or information not included in GIS, including at a minimum: ground and invert elevations, details of inverted siphons, pump station details, pump curves, and force main details.
- Water billing data by meter and all sewer-specific billing/metering data to allocate flows spatially throughout the system.
- Wastewater treatment plant influent flows, including influent pump station SCADA records

B. Hydraulic Model Calibration and Validation

Utilizing data provided by the Flow Monitoring task and provided by the City (SCADA and wastewater treatment plant flows), HDR will complete hydraulic model calibration for dry weather and wet weather flows.

- Calibration of the dry weather flows will be based on flow meter data.
- Wet weather flows will be analyzed for rainfall-derived inflow/infiltration for input into the hydraulic model.

- Wet weather response validation will be completed with up to three (3) rainfall events recorded at the nearest rain gauge, either permanent or provided during flow monitoring.

C. System Performance Criteria Development

HDR will work with the City to define the performance criteria that will trigger the identification of system deficiencies. An evaluation (or trigger criteria) will be developed, followed by a specific design criterion, and each will be associated with a specific, defined wet weather storm event. The criteria could include a range of performance criteria or service factors, including, but not limited to:

- Level of pipe surcharge (depth over diameter criteria)
- Flow velocity
- Percentage of total pipe/pump station capacity

D. Flow Projections

HDR will develop wastewater flow projections through the Master Plan planning period, 2025-2045. The starting point for these projections will be the City's Biosolids Master Plan and the Water System Master Plan, which utilized traffic analysis zone (TAZ) population and employment projections. The TAZ level detail will allow the flow projections to be summarized at different levels of spatial detail, including TAZ, sewer basin, and service area.

Current water meter billing data will be analyzed to determine the wastewater return unit factors to combine with the population and employment projections to develop average day and maximum monthly average day wastewater flow projections. Near-term flow projections will be informed by the development information provided by the City and other service area partners.

E. Existing and Future Conditions Analysis

HDR will develop baseline and future flow scenarios based on the wastewater flow projection developed in Task 2.D to aid in the analysis of existing and future capacity conditions within the sewer collection system, including:

- Analysis of inflow/infiltration patterns to identify candidate subcatchments for targeted investigation and R&R.
- Evaluation of system infrastructure for both existing conditions and the future flow scenarios using the performance criteria (evaluation and design criteria) defined by the City. Deficient infrastructure will be identified, and replacement or parallel infrastructure will be evaluated to eliminate the deficiency.
- As part of the Future Condition Analysis, HDR will identify line extensions that will route future flow from undeveloped portions of the long-term sewer services area for the City to (1) include flows in the hydraulic model (via routing to discharge locations, manholes) and (2) to provide a conceptual layout of potential infrastructure requirements to serve these areas without infrastructure currently.

TASK 2 DELIVERABLES

- Draft and Final Sewer Collection System Hydraulic Modeling Technical Memorandum
- Calibrated Hydraulic Model in AutoDesk InfoWorks ICM (Transportable Database)
- Model Training for City staff

TASK 2 ASSUMPTIONS

- GIS data, record drawings, and documentation provided will be used as-is. Survey data collected in Task 1 will be used for the model development.
- All new infrastructure missing critical data will be identified by the City and all record drawings will be provided to HDR for inclusion in the hydraulic model if not already integrated into the City's GIS data.
- The future condition analysis will be completed for up to three future planning years.
- The hydraulic model will only include City-owned infrastructure:
 - Infoworks ICM inference tools will be used to address any missing invert/slope data for gravity mains; invert data will be flagged to reference data sources (ex. as-built, survey, inferred).
 - Pump stations with pump curve or drawdown information will be included in the model.
 - Private pump station loading will be approximated with loading assumptions.

Task 3 – Risk Prioritization and Asset Management Planning

HDR will build on the insights from the AIA prepared for the City by Black & Veatch in 2019 by incorporating new information into a risk prioritization framework for the sewer collection system and using this prioritization to identify high-risk assets and develop R&R projects. The risk-based prioritization process will be used to identify and evaluate project criticality, while also generating group collaboration and a decision framework for project ranking.

A. Risk Prioritization Framework

HDR will further develop a risk prioritization framework to identify the likelihood and consequence of failure of the gravity sewer mains, force mains, and pump stations within the collection system; this process will leverage condition data from inspections completed for and/or by the City, as well as inspections completed as part of Task 1.

B. R&R Project Identification

Using the risk prioritization and input from O&M staff, R&R and system investigation projects will be identified to be coordinated and integrated with project recommendations from the prior tasks.

TASK 3 DELIVERABLES

- Updated risk prioritization framework
- Summary of assets by risk score
- ESRI ArcGIS Online dashboard for risk prioritization

TASK 3 ASSUMPTIONS

- Wastewater collection system data is available in electronic (tabular or GIS) format, attached to a pipe and with the date of the event (SSO, cleaning, and CCTV).

- HDR will not perform field data collection beyond the task identified in Task 1.

Task 4 – Capital Improvement Plan Development and Master Plan Documentation

A comprehensive 20-year capital improvements plan (CIP) will be developed to address current and future sewer collection system deficiencies identified in the preceding evaluations, spanning the range of capacity, regulatory, resiliency, asset management/R&R, and operational improvement drivers. Project triggers will be identified for capital projects.

A. 20-Year Capital Improvement Plan and Cash Flow Analysis

HDR will compile the recommended projects into a sewer collection system capital improvement plan in Microsoft Excel, ordered based on the timing of need for the projects.

- HDR will develop project opinions of the probable construction cost for recommended projects.
- Project costs will be categorized by planning, design/permitting, and construction over multiple years in the cash flow analysis.

B. Master Plan Document

HDR will draft a Sewer Collection System Master Plan (CSMP) document to incorporate the various elements of this project into a single formal document. The CSMP will be structured to:

- Summarize all evaluation processes completed over the project, as well as the project identification process and results
- Outline steps needed to implement recommended improvements
- Provide a phased schedule for the implementation of projects

In addition to the CSMP report document, HDR will develop capital project summary sheet (1-page) and an ESRI ArcGIS Online dashboard that will provide ready access to master planning documentation and visualization of the risk assessment results and capital project recommendations.

TASK 4 DELIVERABLES

- Capital Improvement Plan Cash Flow Analysis (in Microsoft Excel)
- Draft and Final CSMP Report
- CSMP Summary presentation
- ESRI ArcGIS Online dashboard, expanded from Task 3 to include all CSMP recommended capital projects and CSMP documentation

TASK 4 ASSUMPTIONS

- Workshop will be two hours in length and held at the City's offices
- The City will review the Draft CSMP and return comments in two weeks
- The Draft CSMP will be an electronic deliverable (PDF)
- The Final CSMP will be delivered electronically (PDF), along with 4 printed copies

- Project triggers will be defined for capital projects where a meaningful trigger can be defined and the trigger provides input to an adaptive decision making process.
- ESRI ArcGIS Online dashboard will be a maximum of 3-4 maps/tabs and developed within the City's ArcGIS environment for internal (or external) publication by the City. The City will provide access for the dashboard development.

4 Meetings and Deliverables Summary

The following section outlines project meetings and deliverables by task. In addition to points of contact specified in Section 1, the North Carolina Department of Environmental Quality - Division of Water Infrastructure (DWI) will be copied on the draft and final deliverables.

Table 4-1 Project Meetings and Deliverables by Task

	Meetings	Deliverables
Task 1	<ul style="list-style-type: none"> • Project kickoff workshop • Interviews with wastewater operations staff 	<ul style="list-style-type: none"> • Staff interview notes • Workshop agenda and summary • Survey results in Microsoft Excel for GIS dataset updates • Pump station assessment results in Microsoft Excel
Task 2	<ul style="list-style-type: none"> • System performance criteria workshop • Connectivity review of the hydraulic model meeting • Future growth and development review meeting (with Advisory Board and City Partners) • Review of system deficiencies and proposed solutions workshop • Model training (virtual) 	<ul style="list-style-type: none"> • Draft and Final Sewer Collection System Hydraulic Modeling technical memorandum will be provided detailing the model development, assumptions used, calibration and validation results, a listing of deficient infrastructure, and recommended improvements
Task 3	<ul style="list-style-type: none"> • Risk prioritization framework collaboration workshop • Risk findings workshop 	<ul style="list-style-type: none"> • Updated risk prioritization framework • Summary of assets by risk score • ESRI ArcGIS Online dashboard, for risk prioritization results
Task 4	<ul style="list-style-type: none"> • Review of the Capital Improvement Plan project workshop • Draft CSMP review workshop • Presentation to City Council • Presentation to Advisory Board (virtual) 	<ul style="list-style-type: none"> • Capital Improvement Plan Cash Flow Analysis (in Microsoft Excel) • Draft Master Plan submitted to the City for review. • Final Master Plan incorporating all comments. • Summary presentation for the City's use for communicating with the City Council or similar purposes • ESRI ArcGIS Online dashboard, expanded from Task 3 to include all CSMP-recommended capital projects and CSMP documentation

Workshop Meeting Coordination Assumptions:

- Project kickoff workshop, interview with sewer operations, and system performance criteria workshop will all happen in the same timeframe and trip.
- Future growth and development review meetings and the risk prioritization framework collaboration workshop will happen in the same timeframe and trip.
- Review of system deficiencies and proposed solutions, and the risk findings workshop will happen in the same timeframe and trip.
- The connectivity review of the hydraulic model and the review of capital project workshop will be virtual meetings.

5 Project Compensation and Schedule Summary

Table 5-1 provides a summary of the project estimated compensation and schedule for all tasks identified in Section 3. Table 5-2 project compensation by funding source. Compensation will be on a time and materials basis in accordance with the Fee Schedule in Exhibit C, and invoices will be submitted to the City on a monthly basis. Fees can be shifted between tasks with written approval from the City.

Table 5-1 Project Compensation and Schedule Summary by Task

	Estimated Task Fee	Task Duration (months)
Task 1	\$70,900	4 months
Task 2	\$167,600	8 months
Task 3	\$50,600	3 months
Task 4	\$79,400	4 months
Project Not to Exceed	\$368,500	14 months

Note: Tasks 1-3 will have concurrent service, and total project duration accounts for task overlap.

Table 5-2 Project Compensation by Funding Source*

	NCDWI AIA Grant Funding	City Funding	Task Fee
Task 1	\$40,500	\$30,400	\$70,900
Task 2	\$45,300	\$122,300	\$167,600
Task 3	\$25,000	\$25,600	\$50,600
Task 4	\$39,200	\$40,200	\$79,400
Project	\$150,000	\$218,500	\$368,500

* The amounts in table 5-2 above are estimates and actual compensation shall be in accordance with the Fee Schedule in Exhibit C.

EXHIBIT C

Hourly Fee Schedule for the Work

The total fee for the completion of all Work contained in the Scope of Services **shall not exceed \$368,500.00**, including all reimbursable expenses, which shall be billed at the Firm's actual costs.

HDR's hourly fee schedule includes labor, overhead, and profit and is summarized in the table below.

HDR Hourly Rate / Compensation Schedule

Job Classification	Standard Hourly Rate (\$/hour)
Project Principal/Senior Technical Specialist/ Senior Project Manager	\$250 - \$325
Project Manager	\$230 - \$300
Process/Technical Specialist/Technical Advisor	\$170 - \$300
Senior Civil Engineer	\$190 - \$250
Civil Engineer	\$145 - \$190
Senior Electrical Engineer	\$225 - \$275
Electrical Engineer	\$160 - \$215
Senior Controls Engineer	\$230 - \$280
Controls Engineer	\$175 - \$230
Senior Mechanical Engineer	\$200 - \$275
Mechanical Engineer	\$160 - \$200
Senior Structural Engineer	\$215 - \$280
Structural Engineer	\$155 - \$215
Senior Consultant/Senior Hydraulic Modeler	\$260 - \$310
Senior Utility Management Consultant	\$210 - \$280
Utility Management Consultant/Hydraulic Modeler	\$165 - \$210
Junior Utility Management Consultant	\$120 - \$165
Senior Architect	\$215 - \$280
Architect	\$155 - \$215
Resident Project Representative	\$130 - \$190
Regulatory & Funding Lead	\$250 - \$270
Senior Cost Estimator	\$215 - \$280
Cost Estimator	\$150 - \$215
Project Controls	\$100 - \$180
Admin/Clerical	\$90 - \$120
Accountant	\$90 - \$160

Notes:

1. Mileage reimbursement at the current IRS rate.